THE NEW BRACHIOPOD GENUS *HOWSEIA* FROM THE PERMIAN MAGNESIAN LIMESTONE OF DURHAM

by A. LOGAN

ABSTRACT. The new genus *Howseia* is proposed for certain Permian productoids possessing a non-spinose dorsal valve and a bilobate cardinal process inclined at right angles to the plane of the valve. *Productus latirostratus* Howse, the type-species (designated here), is redescribed, and a lectotype is selected from part of the Howse Collection in the Geological Survey Museum, London. New material from the Middle Magnesian Limestone of Hylton Castle, Durham, is illustrated for comparison. The range and distribution of *Howseia latirostrata* are recorded. *Productus litkei* Licharew from the Permian of Novaya Zemlya is tentatively assigned to the new genus.

ON 17 August 1848 Richard Howse gave a description of a shell, *Productus latirostratus* Howse, which he had found quite commonly in the Shell limestone (reef-facies of the Middle Magnesian Limestone) of Dalton-le-Dale and Tunstall Hill, and his description, without figures, was published as follows: 'Shell gryphaeoid or concavo-convex: lower valve convex bilobed, or with a slight furrow or sinus in the centre, upper valve slightly concave or nearly flat; beak of lower or convex valve large and very much flattened; hinge-line of upper valve rather angulated, furnished with a large triangular button; surface of convex valve covered with a few distant spines.' Howse later figured his species in 1857 and 1858.

On 19 August 1848 William King published a description of this species under the name of *Productus umbonillatus* King, again without any figures, but he later redescribed and illustrated this form in 1850, although his figures are rather inaccurate and were obviously drawn from very scanty material. Davidson (1858) accepted the priority of Howse's description and his figures of *P. latirostratus* Howse are easily the best yet produced. His description was also good and he clearly defined several differences between this form and *P. horridus* J. Sowerby. Later authors were not so sure of the position of this problematic species, for King (1856) decided that it belonged to the genus *Aulosteges* von Helmersen 1847, doubtless from the presence of a marked thickening of the hinge-line margin of the ventral valve which simulates an area. Trechmann (1945, p. 349) also considered specimens of *P. latirostratus* from the Lower Magnesian Limestone of East Thickley to be equipped with a well-defined ventral area, but was loath to separate this form generically from *Horridonia*. Hill (1950, p. 5) tentatively placed *P. umbonillatus* King (= *P. latirostratus* Howse) in a possible subgenus of *Aulosteges*, characterized by a thin-visceraed shell with a low, wide area divided by oblique lines from the umbo, and included with it *A. horrescens* (de Verneuil, 1845), *A. fragilis* (Netschajew, 1894), and *A. longa* (Netschajew, 1900).

Malzahn (1937) decided that there were insufficient grounds for the separation of *P. horridus* and *P. latirostratus* and designated Howse's species as a variety of *Productus* (*Horridonia*) *horridus* J. Sowerby. Branson (1948) was very confused about the position

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of this species, for he listed it twice on the same page (p. 369) under both Howse's and King's names. Thus, according to Branson, '*Horridonia horrida uuubonillata* (King) 1850' was regarded as being completely distinct from '*Horridonia latirostrata* (Howse) 1848'.

Muir-Wood and Cooper (1960, p. 97) mentioned Hill's solution (1950), but failed to assign the species to any particular genus. Muir-Wood (private communication) was undecided whether to place it with *Horridonia* or *Aulosteges* and now thinks that this species lies somewhere between the two, and is worthy of generic discrimination.

Gobbett (1961, p. 43) suggested that *Productus latirostratus* is merely a stunted variety of *Horridonia horrida* (J. Sowerby) which may have lived in a less favourable environment. His illustration of a specimen from the Lower Magnesian Limestone of Ripon, Yorkshire (pl. 3, fig. 7), appears to represent this form.

From an examination of seventeen internal moulds from the Middle Magnesian Limestone of Dalton-le-Dale, in part of the Howse Collection in the Hancock Museum, Newcastle upon Tyne, thirty-four shells from the same formation at Tunstall Hill, from the Kirkby Collection in the same museum, and about seventy shells taken from a road-cutting in Middle Magnesian Limestone at Hylton Castle in my own collection, I have compiled a relatively comprehensive description of this species, with illustrations, which I hope will serve to distinguish it from its nearest relatives. I cannot agree with Gobbett's suggestion of stunting, for this form occurs side by side with large examples of normal *H. horrida* (Sowerby), many of which have extremely well-marked auricles and long spines. Nor can I agree with those who class it as an *Aulosteges*, for there is no interarea, delthyrium, or pseudo-deltidium, and the cardinal process is not trilobate or quadrilobate. On the other hand, the cardinal process projecting perpendicularly to the plane of the dorsal valve is reminiscent of *Aulosteges*. It differs from the typical *Horridonia*—*H. horrida* (Sowerby), which has recently been revised by Gobbett (1961)—in the following respects:

1. There is a complete absence of any kind of spines on the dorsal valve. In over 100 specimens examined I found no trace of any spinosity on the small valve, although the cardinal and visceral regions of the convex large valve were, in most cases, profusely spinose. Howse (1857) found the same feature in the suite of specimens from Dalton-le-Dale in his collection.

2. The cardinal process is quite different in size, shape, and inclination from that prevalent in *H. horrida*. It is also different from any strophalosiid-type cardinal process, while the aulostegid process is similarly inclined, but is trilobate or quadrilobate with a well-marked alveolus.

3. *H. latirostrata* is much smaller than *H. horrida*, while the hinge-line is not straight and does not form the greatest width of the shell. Auricles are thus absent from this species.

4. The umbo of the ventral valve is smaller and more flattened, and does not overhang the dorsal valve. There does not appear to have been any cicatrix of attachment.

5. The sinus is very weak and does not begin at the posterior margin, as in *H. horrida*.

6. The adductor muscle scars of the ventral valve are smaller than, and differ in shape from, those of *H. horrida* (Pl. 108, figs. 7, 8).

7. The ventral valve is much less convex in profile (Pl. 108, figs. 1*c*, 4*c*) in *H. latirostrata*.

8. The hinge-line of the ventral valve tends to thicken and there is a corresponding thickening in the hinge-line of the dorsal valve (Pl. 108, figs. 1*a*, 2, 4*b*, 13) which tends to resemble an interarea. This may be identical with the structure described in a number of Permian and Pennsylvanian species as a 'ginglymus' by Muir-Wood and Cooper (1960), and defined by them as 'a more or less broad, and usually slightly curved surface in the pedicle valve resembling an interarea, in which the posterior margin (usually the lateral ridges) of the brachial valve rotates in opening and closing the shell. It may, however, serve only to close the posterior gape along the hinge margin' (p. 6). There is no definite sign of a delthyrium or elytridium.

9. The adductor muscle scars in the dorsal valve are pear-shaped, not triangular, as in *H. horrida* (Pl. 108, figs. 1*a*, 9–14; text-fig. 1B). They are, in addition, striated, and not dendritic, as in *Horridonia* and the aulostegids.

On these grounds Howse's species is considered to be quite distinct from *H. horrida* (Sowerby), and, in terms of the strict generic definitions within the productoids at the present time, forms the basis of a new genus which I propose to designate *Howseia* (Ety: patronymic for R. Howse), with type-species *Productus latirostratus* Howse, 1848.

SYSTEMATIC DESCRIPTION

Suborder PRODUCTOIDEA Maillieux, 1940
Superfamily ?STROPHALOSIACEA Muir-Wood and Cooper, 1960
Family ?AULOSTEGIDAE Muir-Wood and Cooper, 1960
Subfamily ?ECHINOSTEGINAE Muir-Wood and Cooper, 1960

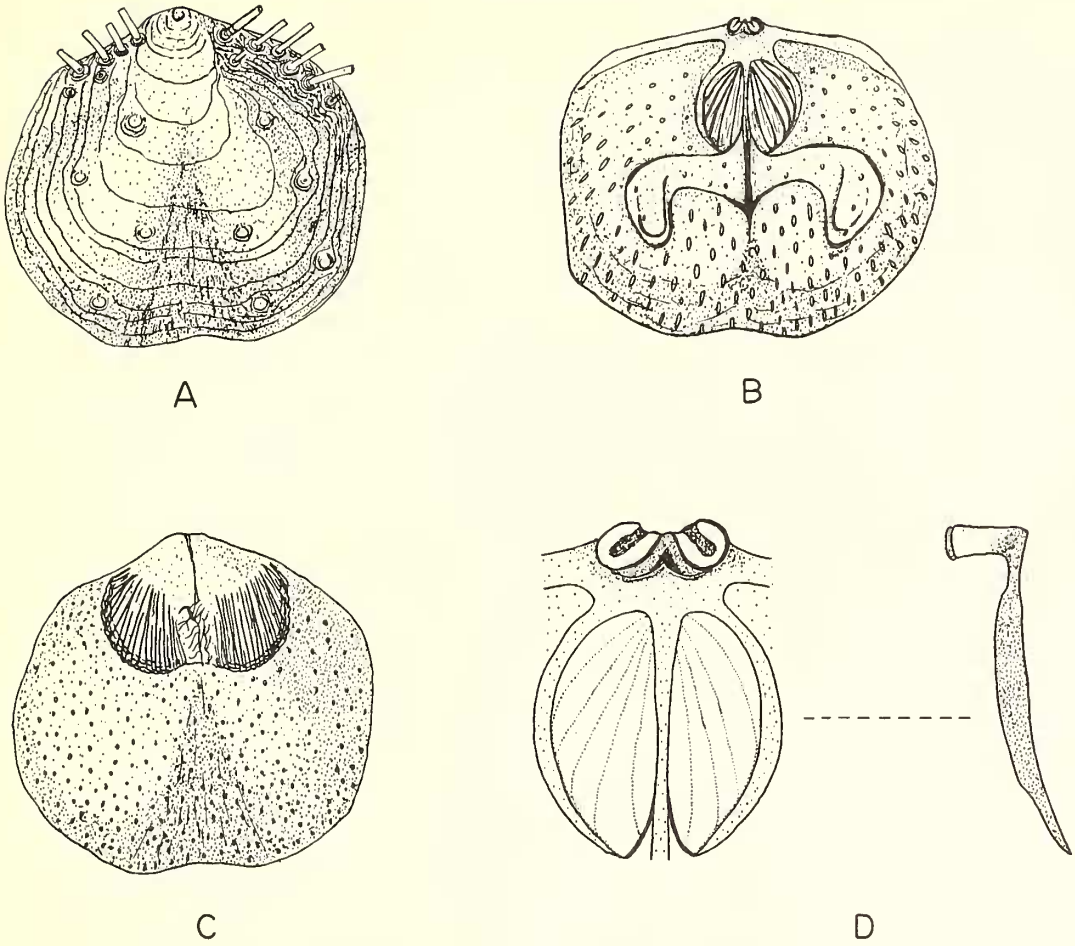
Genus HOWSEIA gen. nov.

Type-species. *Productus latirostratus* Howse, 1848, p. 256.

Diagnosis. Productoid, without cardinal and body spines on the concave dorsal valve. Cardinal process bilobate, with each lobe grooved, and extending at right angles to the plane of the valve. Hinge-line sometimes angulated, and shell margins at hinge thickened, simulating an interarea; no delthyrium or elytridium. Dendritic adductor scars in ventral valve only. Ventral valve moderately convex, with sinus weak; two to three rows of cardinal spines, body spines sparse.

Discussion. The genus *Howseia* is placed in the family Aulostegidae with some doubt. This family was defined by Muir-Wood and Cooper (1960, p. 94) to include forms with an interarea and delthyrium closed by an elytridium (or pseudo-deltidium). In addition, the trilobate or quadrilobate cardinal process and dendritic dorsal valve adductor scars typical of the aulostegids are lacking in *Howseia*. However, Muir-Wood and Cooper include *Xenosteges*, a form very similar to *Howseia*, with a bilobate cardinal process and non-dendritic muscle scars, within their family Aulostegidae and subfamily Echinosteginae; this procedure has been provisionally adopted here.

The main differences between *H. latirostrata*, the type-species of *Howseia* gen. nov., and *H. horrida*, the type-species of *Horridonia* Chao, have already been listed. *Aulosteges* von Helmersen differs from *Howseia* by its well-defined ventral interarea and delthyrium; in addition both valves are ornamented with profuse spines of two series. There are also several internal differences between the two genera. *Echinosteges* Muir-Wood and Cooper



TEXT-FIG. 1. *Howseia latirostrata* (Howse). A, Reconstructed drawing of the ventral valve from several specimens, showing the arrangement of the spines, ×1. B, Internal structure of the dorsal valve, showing the cardinal process, median septum, musculature and brachial ridges, ×1. C. Ventral valve musculature, illustrated by an internal mould, ×1. D, Cardinal process enlarged in both interior and side views, showing the bilobation, the median grooves in each lobe, and the angle of inclination of the process, ×3.

has a trilobate cardinal process and dendritic adductor muscle scars in both valves in the adult shell, and possesses a non-spinose dorsal valve with irregularly developed rugae and dimples, while the dorsal valve of *Howseia* is smooth or ornamented with concentric growth lamellae only. *Echinosteges* can also be distinguished from *Howseia* by its well-marked interarea and delthyrium, and by its ornament of posteriorly placed rugae with prostrate or suberect spines, medianly placed spine ridges, and coarse anterior costae bearing curved erect spines. In addition, there are rows of rhizoid spines near the hinge, and in groups on the ears, flanks and, occasionally, on the pseudo-deltidium. The genus *Edriosteges* Muir-Wood and Cooper is distinguished from *Howseia* by its wide, straight hinge-line, which forms the greatest width of the shell and by its densely spinose ventral

valve. The cardinal process is trilobate, while the adductor muscle scars of the dorsal valve are, in part, dendritic.

The poorly known *Girlasia* de Gregorio would also seem to be related, for it has a bilobate cardinal process, but it possesses a short interarea and delthyrium. In addition, it is more elongate in outline and the ventral valve is profusely spinose, while the dorsal valve has rare, scattered spine-bases of small diameter.

Xenosteges Muir-Wood and Cooper resembles *Howseia* in its bilobate, posteriorly grooved cardinal process and its non-dendritic dorsal adductor scars. It may be distinguished, however, by its strongly convex ventral valve, wide, straight hinge-line, and narrow interarea, with delthyrium, and non-dendritic ventral adductor muscle scars. Muir-Wood and Cooper remark (1960, p. 111) that 'the affinities of *Xenosteges* are with the aulostegids, but no genus of that family resembles this genus closely, and it appears to be a specialised form in its manner of cementation, lack of ornamentation and restriction of the spines to creeping attachment spines' (i.e. the long, rhizoid spines near the hinge and on the ears of the ventral valve). 'The interior, on the other hand, is less advanced, especially in the bilobed character of the cardinal process and the non-dendritic muscle scars.' These remarks, in general, might equally well apply to the genus *Howseia*.

Howseia latirostrata (Howse) 1848

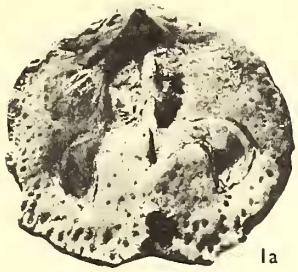
Plate 108, figs. 1–6, 8–14; text-fig. 1

1848 *Productus latirostratus* Howse, p. 256.
1848 *Productus umbonillatus* King, p. 8.
1850 *Productus umbonillatus* King, p. 92, pl. 11, figs. 14–18.
1854 *Productus umbouillatus* King; Schauroth, pl. 1, figs. 9 and 10 (not 8).
1856 *Aulosteges umbonillatus* (King), pl. 12, fig. 6.
1857 *Productus latirostratus* Howse, p. 46, pl. 4, figs. 1 and 2.
1858 *Productus latirostratus* Howse, p. 18, pl. 11, figs. 1 and 2.
1858 *Productus latirostratus* Howse; Davidson, p. 36, pl. 4, figs. 1–12.
1861 *Productus latirostratus* Howse; Geinitz, p. 102, pl. 19, figs. 7–10.
1871 *Productus umbonillatus* King; Quenstedt, p. 640, pl. 60, fig. 8.
1937 *Productus horridus* var. *umbonillatus* King; Malzahn, p. 34.

EXPLANATION OF PLATE 108

Figs. 1–6, 8–14. *Howseia latirostrata* (Howse). 1*a–c*, Dorsal, ventral and lateral views of the lectotype, G.S.M. 59737, figured by Howse, 1857, 1858; Davidson, 1858. Middle Magnesian Limestone, Dalton-le-Dale, Durham (×1½). 2, Dorsal view of specimen figured by W. King, 1850, pl. 11, fig 16, as *Productus umbonillatus* King. Middle Magnesian Limestone, Tunstall Hill, Durham (×1¼). 3, Ventral view of specimen figured by W. King, 1850, pl. 11, fig. 14, same locality as fig. 2 (×1¼). Both specimens in King Collection, University College, Galway. 4*a–c*, Ventral, dorsal and lateral views, Middle Magnesian Limestone, Hylton Castle, Durham (×1¾). 5, Ventral view, same locality and horizon as fig. 4 (×1¼). 6, Ventral view, same locality and horizon as fig. 4 (×1¼). 8, Ventral valve internal musculature, same locality and horizon as fig. 4 (×1½). 9, Cardinal process and adductor muscles, dorsal valve, Middle Magnesian Limestone, Tunstall Hill (×3). 10, Dorsal view of juvenile specimen, same locality and horizon as fig. 4 (×1¼). 11, Dorsal view, same locality and horizon as fig. 4 (×1¼). 12, Dorsal valve interior, same locality and horizon as fig. 4 (×1¼). 13, Dorsal view, same locality and horizon as fig. 4 (×1½). 14, Dorsal view, same locality and horizon as fig. 4 (×1½). Figs. 4–6, 8–14, now in collection of British Museum of Natural History.

Fig. 7. *Horridonia horrida* (J. Sowerby). Ventral valve internal musculature, Middle Magnesian Limestone; Humbleton Hill, Durham (×1½). Specimen in the author's collection, Hancock Museum, Newcastle upon Tyne.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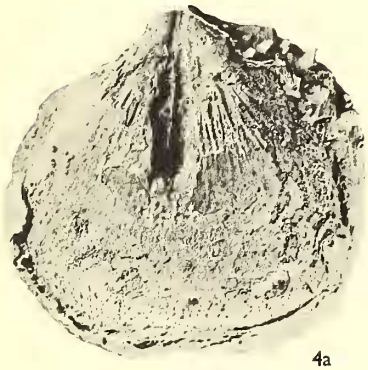
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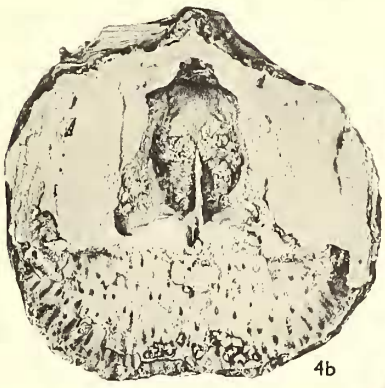
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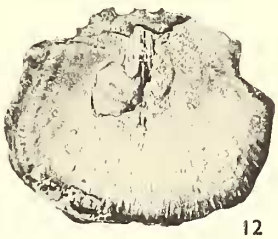
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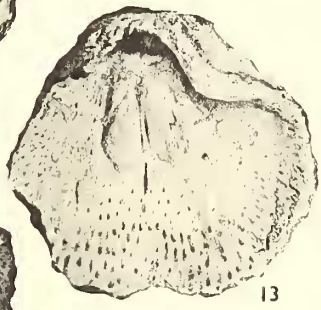
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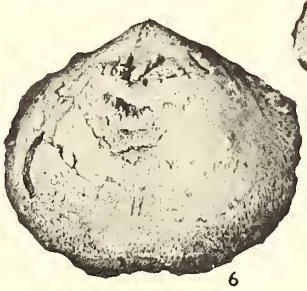
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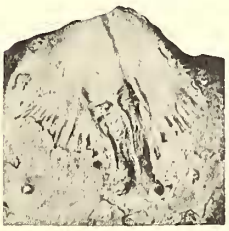
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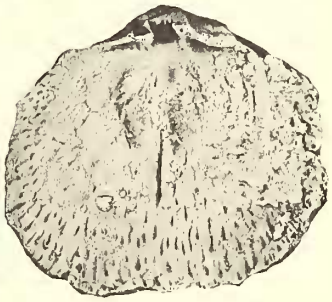
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LOGAN, *Howesia*

Type-specimen and locality. Howse (1857; 1858) based his diagnosis of *P. latirostratus* on an internal mould of the dorsal valve from the Middle Magnesian Limestone of Dalton-le-Dale, which Davidson later figured (1858, pl. 4, fig. 5). This specimen is now in the collection of the Geological Survey Museum, London (G.S.M. No. 59737), and has been selected by the author as lectotype (Pl. 108, figs. 1*a–c*). There is some very poor topotype material (seventeen specimens) from the Howse Collection in the Hancock Museum; these specimens are obviously remnants and the main part of the Howse Collection would appear to be missing. Attempts to uncover the type exposure have failed; it has undoubtedly long since been filled in and there is no prospect of collecting any further topotype material. Howse also based his species on material in the Kirkby Collection from the Middle Magnesian Limestone of Tunstall Hill. This locality could also be regarded as a type locality and thirty-four specimens in the Hancock Museum have been examined.

The specimens figured by King (1850, pl. 11, figs. 14–17) as *Productus umbonillatus* King were also from Tunstall Hill, and have been kindly loaned to me by Professor Mitchell of University College, Galway (Pl. 108, figs. 2, 3). They are undoubtedly conspecific with Howse's specimens from Dalton-le-Dale.

A suite of seventy well-preserved specimens, collected from the Middle Magnesian Limestone at Hylton Castle, several miles north-north-west of Dalton-le-Dale and Tunstall, but still on the line of the ancient barrier-reef (see Trechmann, 1925), yielded some additional information on this species. Many have been figured (Pl. 108, figs. 4–6, 8, 10–14) and the description of the species is mainly based on these specimens.

Description. Form subquadrate, tapering posteriorly. Ventral valve convex but less so than in *Horridonia horrida*—in young forms it is almost flat. A very shallow sinus commences at about the mid-line of the valve and extends to the anterior margin. The pointed beak is not inflated, nor does it extend beyond the extremity of the cardinal edge. The hinge-line is not straight and is usually shorter than the greatest width of the shell; auricular expansions are poorly defined. The shell margin of the valve is thickened at the hinge-line, giving an impression of an interarea. Two or three rows of numerous long spines are present on the cardinal region of the ventral valve, extending in line with the shell surface (more numerous than in any of Davidson's figures), but less numerous and less regularly scattered spines occur on the rest of the valve (text-fig. 1A). The concave dorsal valve has no cardinal or body spines. Both valves ornamented with concentric growth lamellae which curve round the well-marked spine-bases on the ventral valve.

The ventral muscle impressions occupy a triangular area in the valve. The oval adductor muscles are slightly elevated, with the dendritic impressions connected by a thin line to the tip of the umbo (Pl. 108, fig. 8; text-fig. 1C). They are flanked on either side by the large, flat, striated impressions of the diductor scars.

In the dorsal valve the hinge-line is thickened and slightly flanged; the cardinal process is bilobate, with a deep slit or groove along the upper or posterior surface of each divergent lobe, the process being directed at right angles to the plane of the valve (Pl. 108, fig. 9; text-fig. 1D). The lateral ridges extend to the lateral margins and the median septum extends for two-thirds to three-quarters of the length of the visceral disk, being anteriorly developed as a breviseptum. On either side are seen the adductor muscle impressions, bounded by ridges. The muscles are pear-shaped and striated; brachial